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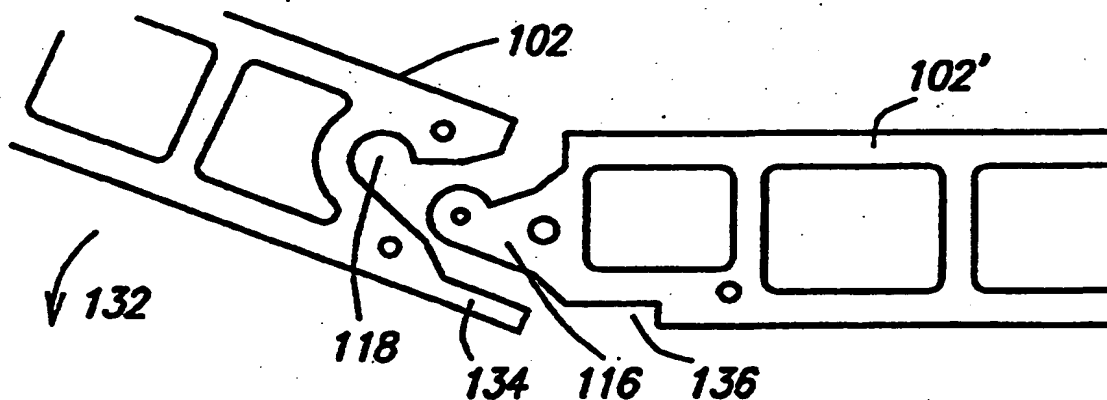
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(54) Title: CONSTRUCTION ELEMENTS



(57) Abstract

The invention of the application relates to the provision of a construction element (102) which can be used in combination with other similar elements and to the constructions formed. One particular construction which can be formed are floors such as floors of transportable goods storage areas which conventionally are formed of wooden planking or blockboard covered with sheet metal. The construction elements (102) of the invention are formed of plastics material, preferably formed by extrusion and are provided with location means (116, 118) to allow engagement of adjacent elements preferably directly or alternatively by providing intermediate engagement members. The location means are also formed in a manner, if required, to ensure that the load bearing capacity of the elements is not impaired.

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### Construction Elements

The subject of this application is a construction element and method of manufacture therefore, and the use of the same in combination with other similar construction elements to form constructions such as particularly, but not exclusively, a floor, of, for example, a transportable goods storage area. The construction elements are formed from plastics material and allows distinct advantages over known construction elements manufactured from other materials to be obtained.

The construction elements can thus be used for many purposes such as the construction of floors for transportable goods storage areas in, for example, containers for carriage by vehicle or train, swap bodies, body demountables for vehicles, truck body floors, floors for buildings and many other application such as walls, wall cladding and such like.

At the present time flooring for the storage areas of vehicles or containers to be carried on vehicles are typically constructed by placing and securing a plurality of wooden planks onto support beams or the metal framework of the chassis or, alternatively, by using sheets of blockboard joined together and coated in sheets of metal to form the floor surface. The wooden planks are prone to wear, damage and splitting and can harbour spilled materials therein and are difficult to keep clean. The coating of floors with sheet metal does render the floors easier to clean and limits damage to the floor and to this end this type of flooring is extensively used by supermarket delivery vehicles and in any area where foodstuffs are to be carried as this type of flooring is generally more hygienic and easier to clean. However, this type of flooring is also considerably more

expensive to manufacture due to the materials used and is also relatively noisy when trolleys and goods are loaded and unloaded from the same. This is an important consideration when the storage areas are being loaded and unloaded in residential areas during the night.

A further consideration is that at present the vast majority of wooden planks are formed from laminated hardwood which is becoming increasingly expensive due to the increase in prices of hardwood. The excessive use of hardwoods worldwide has resulted in increasing pressure to reduce the use of the same in order to reduce the impact on the environment.

The aim of the present invention is to provide construction elements of a form and of a material which allows the elements, in combination, to be used to form constructions such as floors whilst at least maintaining and preferably increasing the durability and load bearing capacity of the same.

In a first aspect of the invention there is provided a construction element characterised in that the element is in the form of an elongate member having first and second faces interconnected by side walls provided with location means to allow engagement with adjacent construction elements and the elements are formed from plastics material.

In one embodiment one side wall is provided with a male location means and the other with a female location means and the location means are formed along the length of the side walls.

In one preferred embodiment the female location means of a first construction element is fitted onto the male location

means of a second, adjacent, construction element with the first construction element disposed at an angle to the second element and the location means are locked in position by moving the first construction element pivotally about the location means to lie in the same plane as the second construction element.

In addition to allowing adjacent construction elements to be engaged the location means are also preferably formed in a manner to prevent relative movement of the same and also to allow any stresses acting on the elements, when the same are used to carry loads, to be evenly distributed throughout the elements and provide a continuity of load bearing strength throughout the construction formed.

Alternatively, the construction elements are held in engagement with adjacent construction elements via engagement members which have location means to connect with the location means on the construction elements and thereby serve to connect the construction elements.

In a further feature, at least one side wall is provided with a lug for the engagement of securing means thereto. In one embodiment a first side wall has a lug formed therein and the second side wall has a recessed portion formed therein for the location of the lug of an adjacent element. In order to secure the construction element to the structure upon which the construction elements are mounted a securing means is provided having a clip portion to clip around at least part of the lug on the construction element to secure the same to the structure. Typically a plurality of clips are located on the lug at spaced intervals along the length of the construction element.

In a further feature of the invention at least one of the side walls is provided with a sealing material or formation. Preferably the sealing material or formation is provided on the portion of the side walls defining the location means and is located such that when adjacent construction elements are brought into engagement the engagement of the location means causes compression of the sealing material to ensure that a seal between the adjacent elements is formed.

In a further preferred feature, especially when the construction elements are used to form a floor, there is provided on at least one of the first and second faces of the construction element a non slip material which can be attached after the floor has been formed or alternatively can be formed as an integral part of the element.

Typically the construction element is hollow thereby saving material but in order to strengthen the element particularly when the same is to be load bearing there is provided intermediate the outer surfaces of the construction element at least one supporting rib.

Typically a plurality of supporting ribs are formed in parallel with the side walls of the construction element along the length of the element and these define longitudinal channels in which reinforcing members can be located or alternatively the construction elements can be formed around the reinforcing members in effect coating the same. The reinforcing means can be formed of metal or another suitable material.

Preferably the walls of the construction element are all of substantially equal thickness and, if necessary, a plurality of elongate apertures are provided to ensure that the wall



thickness is substantially constant. Preferably the width to height ratio of the construction element is 2:1.

The formation of the construction element from plastics material is of significant advantage and a preferred plastics material is a load bearing thermoplastics material such as High Density Polyethylene (HDPE) and preferably a Class 3 High Density Catalyst HDPE including a filler to increase the modulus of the material. In one embodiment the filler is in the form of talcum powder in a preferred range of 25-35% and yet more preferably 30%. The plastics has a preferred melt index of between 0.5 to 1. One known type of plastics material is HDPE 801 Type 400 55E. A plastics material of this form is manufactured by Dow Chemical Corporation.

In one embodiment the plastics material is of food grade to allow loose and granulated foodstuffs, vegetables and such like to be stored directly on the flooring.

Preferably the plastics material is impervious to water and resistant to chemical spillage and/or contamination.

It has been found that the manufacture of the construction elements by extruding the plastics material is particularly advantageous. A preferred method is by using a single screw extrusion apparatus having a weight capacity of 2kg per metre.

Preferably the sealing material and/or non-slip material are co-extruded with the construction element.

The plastics material can have colour pigment added thereto to meet specific customer requirements.

In a further aspect of the invention there is provided a floor, said floor formed from a plurality of elongate construction elements characterised in that the elements are formed of plastics material and are provided with location means along the length thereof to allow edges of adjacent elements to be brought into engagement and, in combination, form the floor.

The floor may be the floor of a building or a ships deck or the floor of a transportable goods storage area. Particularly, when the floor is that of a goods storage area, the construction elements are secured to the sub frame of the goods storage area by non-intrusive securing means.

In one embodiment the securing means has a portion for securing to the sub frame and a clip portion which clips around a lug portion formed on the construction element.

In a further aspect of the invention a construction is formed using construction elements according to the present invention characterised in that the construction is any of a pallet, shutter doors, sliding doors, scaffolding boards, vegetable boxes, folding boxes, fences, stalls, shelving, benches or crash barriers.

Alternatively the construction element according to the invention with or without location means can be used independently such as as a lintel or as a rail track sleeper.

When used as or on a railway track sleeper the same can be manufactured in predetermined colours to indicate particular features such as approaching a station, signals, tunnels, level crossings and such like.

When a floor is constructed for a transportable goods storage area using a plurality of the construction elements located together the overall weight of the floor is significantly less than a floor formed of wooden planks thus when the floor is formed in the goods storage area of a vehicle a considerable reduction in the overall weight of the vehicle is achieved.

Specific embodiments of the invention are now described with reference to the accompanying drawings wherein;

Figure 1 illustrates construction elements of the invention used in the construction of a floor of a transportable goods storage area;

Figure 2A illustrates a cross sectional elevation through one of the construction elements of the invention in a first embodiment;

Figure 2B illustrates the elements of Figure 2A used to form a shutter door construction;

Figures 3A and 3B illustrate cross sections of second and third embodiments of construction elements respectively;

Figures 4A and 4B illustrate construction elements according to Figures 3A and 3B in engagement with adjacent construction elements;

Figure 5 illustrates a cross section of a further embodiment of a construction element according to the invention;

Figure 6 illustrates construction elements of Figure 5 being brought into engagement;

Figure 7 illustrates the construction elements of Figure 6 in engagement;

Figures 8A and 8B illustrate construction elements with non slip material provided; and

Figure 9 illustrates a cross section of a construction element with a plurality of different forms of reinforcing members located therein.

Referring firstly to Figure 1 there is shown a container body 1 having a floor 3 which is formed from a series of construction elements 2 of the invention. The side walls of the construction elements are placed side by side to form the floor and the construction elements are secured to the sub-frame 6 and preferably the members of the same which lie at right angles to the longitudinal axis of the construction elements 2.

Each elongate length has a first load bearing face 8, a second face 10 and two side walls 12,14 as shown in Figure 2A which is a cross sectional view of one of the construction elements in a first embodiment. The edges are provided with location means which include a male location means in the form of a protrusion 16 on one edge and a female location means in the form of a recess 18 on the other. Typically the location means are formed along the length of the member. When the members are placed in position to form the floor they are placed such that the protrusion 16 on the side wall 14 of a first element lies in the recess 18 on the side wall 16 of the adjacent element 2 thereby engaging the elements in position and so on with successive elements until the floor or other construction is formed. When the last of the construction elements are positioned, the location means

on the side walls which are to form the external edges of the construction can be removed, or not provided.

The construction elements are extruded in a form having a series of longitudinal internal channels 20, said cavities defined by internal strengthening ribs 22 to provide the required strength of the construction elements.

Figure 2B illustrates the construction elements of Figure 2A in combination to form a construction in the form of a shutter door 24 which is shown partly closed wherein the construction elements, in this example, are held in position by flexible support bands 26 which are attached to the faces 10 of the elements but could be engaged via hinge location means. The location means 16, 18 engage when the elements lie in the same plane to provide rigidity to the construction. To improve the use of the shutter the ends of the elements are provided to run along guide means 28.

Figures 3A and 3B illustrate second and third embodiments of the construction element wherein the side walls 12, 14 are provided with male and female location means 16, 18 of different forms to suit specific requirements. The Figures also illustrate the manner in which the supporting ribs 22 can be shaped to define the profile of the longitudinal channels 20 to suit specific load bearing requirements.

Figures 4A and 4B illustrate the construction elements 2 of Figures 3A and 3B respectively in engagement with adjacent construction elements 2' of the same form. The male location means 16 of one element 2 are shown to lie in engagement with the female location means 18 of the adjacent element 2' to locate the two and this is repeated with successive elements until the floor is constructed. These figures also illustrate

the provision of a sealing material 30 on at least one of the location means 16, 18 such that when the location means are in engagement the sealing material contacts both and acts to form a seal between the elements.

As an alternative to providing complex location means on the side walls of the construction elements the location means may be relatively simple in form or even a straight face and engagement members are provided between adjacent elements and onto which the elements locate thereby serving to engage adjacent elements.

Figures 5, 6 and 7 illustrate a further embodiment of a construction element which is described herein as 102 and is particularly suited for use in forming floors for load bearing. The element has a first, load bearing, face 108, a second face 110 and side walls 112 and 114. The face 112 has a female location means 118 defined therein and the face 114 has a matching male location means 116 defined therein. The location means are engageable by placing the female location means 118 onto the male location means 116 on an adjacent construction element 102' as shown in Figure 6. The location means are so formed such that the element 102 is required to be placed at an angle relative to element 102' to enable the location means to be fitted onto each other. Once fitted, the location means are locked in position by pivotally moving element 102 as indicated by arrow 132 on Figure 6 to bring the element 102 to lie in the same plane as element 102' as shown in Figure 7. If a sealing material is provided the material will be compressed when the elements are in the position shown in Figure 7.

To enable the construction elements to be secured to the subframe a lug 134 is provided on at least one side wall and

a matching recess 136 is provided on the other side wall such that when the adjacent elements are in an engaged position as shown in Figure 7 they can still lie flat. Typically a securing means is provided which is connected to the subframe and clips around the lug in a space between the recess 136 and lug 134 (not shown) to secure the construction element in a non-intrusive manner and thus there is no requirement to drill into or provide apertures in the element 102 and weaken the same.

Elongate apertures 138 are however provided along the length of the elements to ensure that the thicknesses of all of the walls are kept substantially equal thereby improving the cooling of the same during the extrusion process and reducing any creation of stresses in the element.

Figures 8A and 8B illustrate construction elements and indicate the manner in which non slip material 40 can be provided either recessed as shown in Figure 8A or on top of the elements as shown in Figure 8B and in whichever embodiment the slippage of materials on the elements can be prevented by providing the non-slip material.

Figure 9 illustrates various forms of reinforcing members 42 which can be provided, if required, in the longitudinal channels 20 of the construction elements to increase the load bearing capacity of the elements.

The construction elements of the invention provide a complete alternative to the use of wooden planks in the construction of floors. Furthermore the use of High Density polyethylene has been found to render the members more durable than conventional wooden planks with a longer service life.

When the sealing material is provided between adjacent elements a smooth watertight floor can be constructed which meets International Standard Organisation (ISO) weight loading and rigidity specifications.

Another advantageous aspect of the construction elements of the invention is that they are considerably lighter in weight than conventional wooden elements or concrete materials. If the lengths are used to construct floors in goods storage containers for vehicles so the weight of goods which can be carried can be increased while allowing the vehicle to still be within the weight limits as a direct result of the reduction in weight of the container. Furthermore as wood absorbs and retains moisture and water this can dramatically increase the weight of the same. In humid conditions the weight of wooden planks can increase by 20% and double the original weight when wet. The material from which the constructional elements of the invention are made is impervious to water, humidity changes, liquid and odour tainting and most corrosive chemicals thereby preventing the character of the floor from changing due to external conditions.

The imperviousness to foreign matter also allows improved humidity control and also reduces the problems of bacteria and germs and infestations being harboured in the floor as is the case with conventional wooden planks.

Finally the construction elements of the invention can be used in extreme changes of temperature without damage. This is particularly useful for use in constructions where the goods are held in sub zero temperatures or where the floors are exposed to Extreme weather conditions.

As the construction elements are formed from extruded plas-



tics material elements can be extruded to the required length to be constructed and hence no end to end joints are required between elongate lengths. This reduces the fitting time required and also reduces the possibility of the ends protruding and causing damage to goods or causing injury to persons. Furthermore it is not known for construction elements to be formed from plastics material and still be capable of acting as load bearing elements as is the case in the current application due to the formation and location means provided between adjacent elements which allow all of the other advantages to be obtained for specific construction such as in particular floors.

**CLAIMS**

1. A construction element characterised in that the element is in the form of an elongate member having first and second faces interconnected by side walls provided with location means to allow engagement with adjacent construction elements and the elements are formed of plastics material.
2. A construction element according to claim 1 characterised in that one side wall is provided with a male location means and the other with a female location means.
3. A construction element according to claim 2 characterised in that the location means are formed along the length of the side walls.
4. A construction element according to claim 2 characterised in that the female location means of a first construction element is fitted onto the male location means of a second, adjacent, construction element with the first construction element disposed at an angle to the second element and the location means are locked in position by moving the first construction element pivotally about the location means to lie in the same plane as the second construction element.
5. A construction element according to any preceding claim characterised in that on at least one side wall there is provided a lug for the engagement of securing means thereto.
6. A construction element according to claim 5 characterised in that a first side wall has a lug formed therein and the second side wall has a recessed portion formed therein for the location of the lug of an adjacent element.

7. A construction element according to claims 5 or 6 characterised in that a clip is provided in connection with the structure upon which the construction elements are mounted which is provided to clip around at least part of the lug on the construction element to secure the same to the structure.
8. A construction element according to claim 7 characterised in that a plurality of clips are located on the lug at spaced intervals along the length of the construction element.
9. A construction element according to any of the preceding claims characterised in that in at least one of the side walls a sealing material is provided.
10. A construction element according to claim 9 characterised in that the sealing material is provided on the portion of the side walls defining the location means.
11. A construction element according to claims 9 or 10 characterised in that the sealing material is located such that when adjacent construction elements are brought into engagement the engagement of the location means causes compression of the sealing material to ensure that a seal between the adjacent elements is formed.
12. A construction element according to any of the preceding claims characterised in that on at least one of the first and second surfaces there is provided a non slip material.
13. A construction element according to claim 12 characterised in that the non slip material is provided as an integral part of the construction element.
14. A construction element according to any of the preceding

claims characterised in that, intermediate the outer surfaces of the construction element there is provided at least one supporting rib.

15. A construction element according to claim 14 characterised in that a plurality of supporting ribs are formed in parallel with the side walls of the construction element along the length of the element.

16. A construction element according to claim 15 characterised in that reinforcing members are located in the longitudinal channels defined between the supporting ribs.

17. A construction element according to any of the preceding claims characterised in that the walls of the construction element are all of substantially equal thickness.

18. A construction element according to claim 17 characterised in that a plurality of elongate apertures are provided to ensure that the wall thickness is substantially constant.

19. A construction element according to any of the preceding claims characterised in that the element is formed of a load bearing thermoplastics material such as High Density Polyethylene (HDPE).

20. A construction element according to claim 19 characterised in that the element is formed of a Class 3 High Density Catalyst HDPE including a filler to increase the modulus of the material.

21. A construction element according to any of the preceding claims characterised in that the element is extruded.

22. A construction element according to claim 21 characterised

ised in that the element is extruded using a single screw extrusion apparatus.

23. A construction element according to claims 20 and 21 characterised in that the sealing material and/or non-slip material are co-extruded with the construction element.

24. A construction element according to any of the preceding claims characterised in that the plastics material used has colour pigment added thereto to meet specific requirements.

25. A floor, said floor formed from a plurality of elongate construction elements characterised in that the elements are formed of plastics material and are provided with location means along the length thereof to allow edges of adjacent elements to be brought into engagement and, in combination, form the floor.

26. A floor according to claim 25 characterised in that the floor is the floor of a building.

27. A floor according to claim 25 characterised in that the floor is the floor of a transportable goods storage area.

28. A floor according to claim 27 characterised in that the construction elements are secured to the sub frame of the goods storage area by non-intrusive securing means.

29. A floor according to claim 28 characterised in that the securing means has a portion for securing to the sub frame and a clip portion which clips around a lug portion formed on the construction element.

30. A floor according to claim 25 characterised in that the

floor is a ship deck.

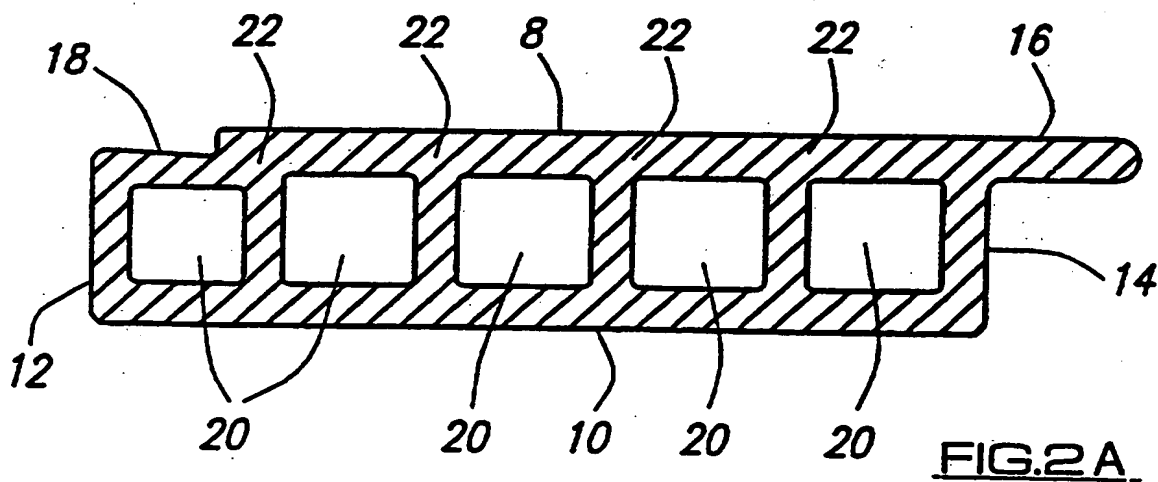
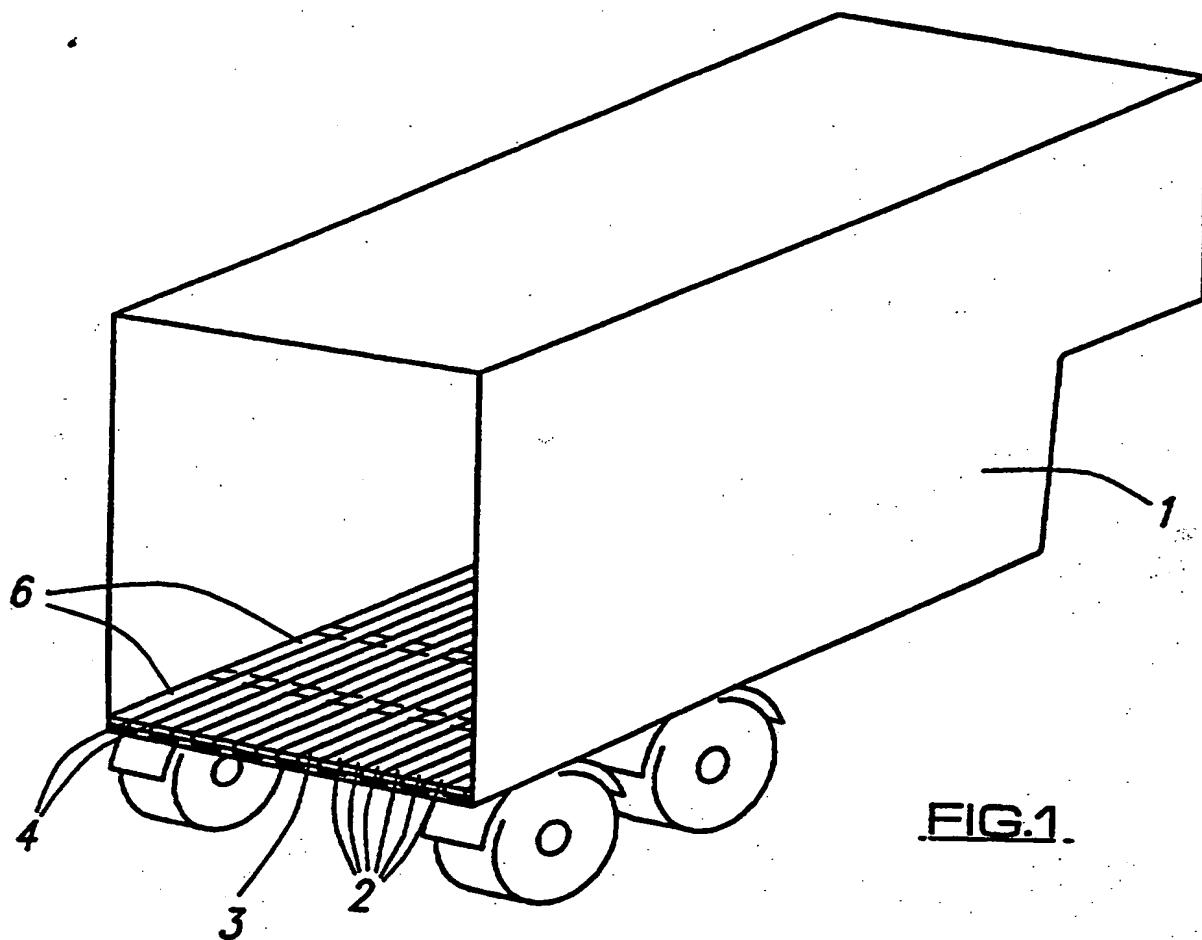
31. A construction formed using construction elements according to the present invention characterised in that the construction is any of a pallet, shutter doors, sliding doors, scaffolding boards, vegetable boxes, folding boxes, fences, stalls, shelving, benches or crash barriers.

32. A construction element according to any preceding claim characterised in that the same can be used independently such as as a lintel or as a rail track sleeper.

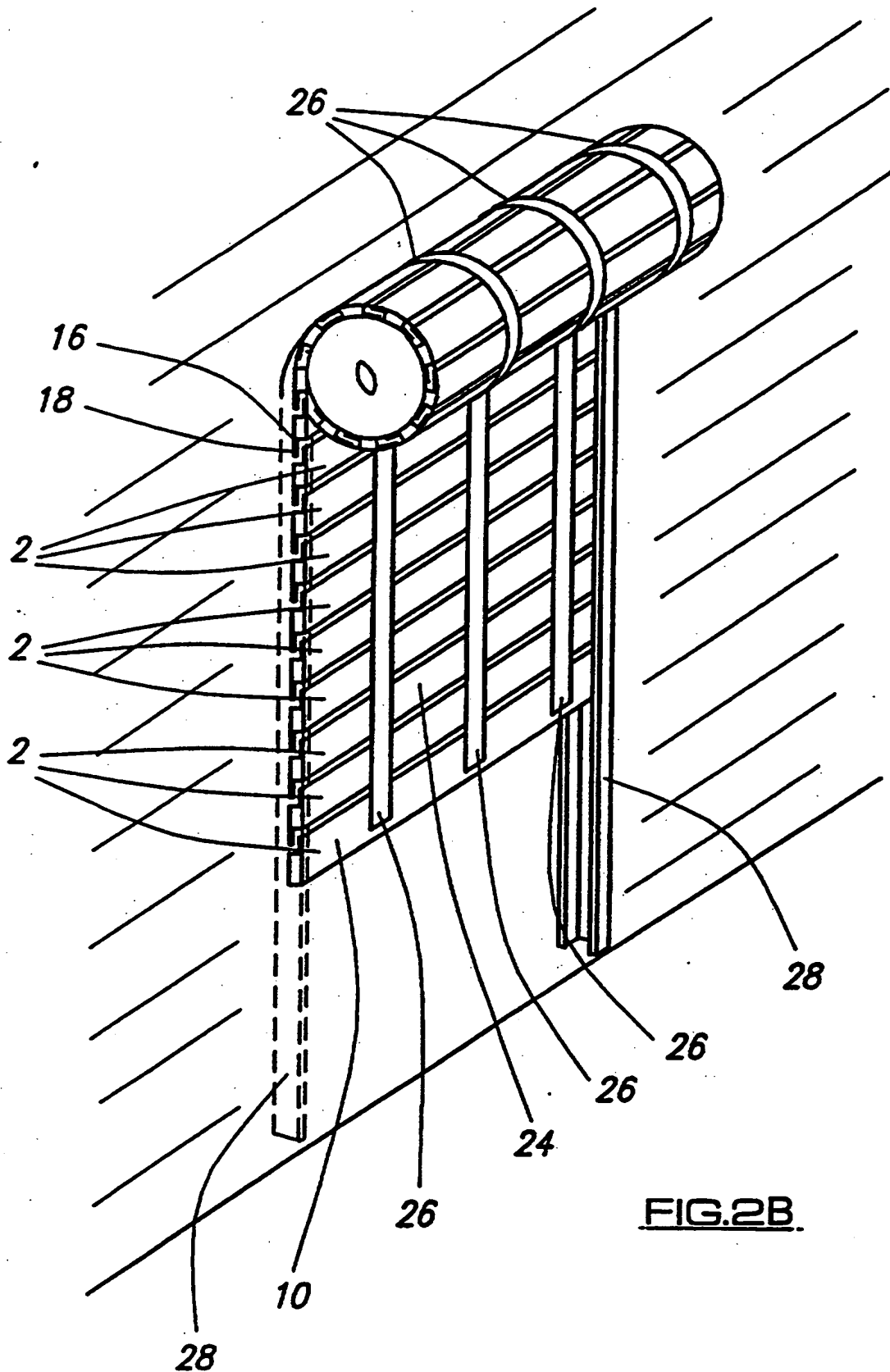
33. A construction element according to claim 32 characterised in that when used as or on a railway track sleeper the same can be manufactured in predetermined colours to indicate particular features such as approaching a station, signals, tunnels, level crossings and such like.

34. A construction element as hereinbefore described with reference to the accompanying drawings.

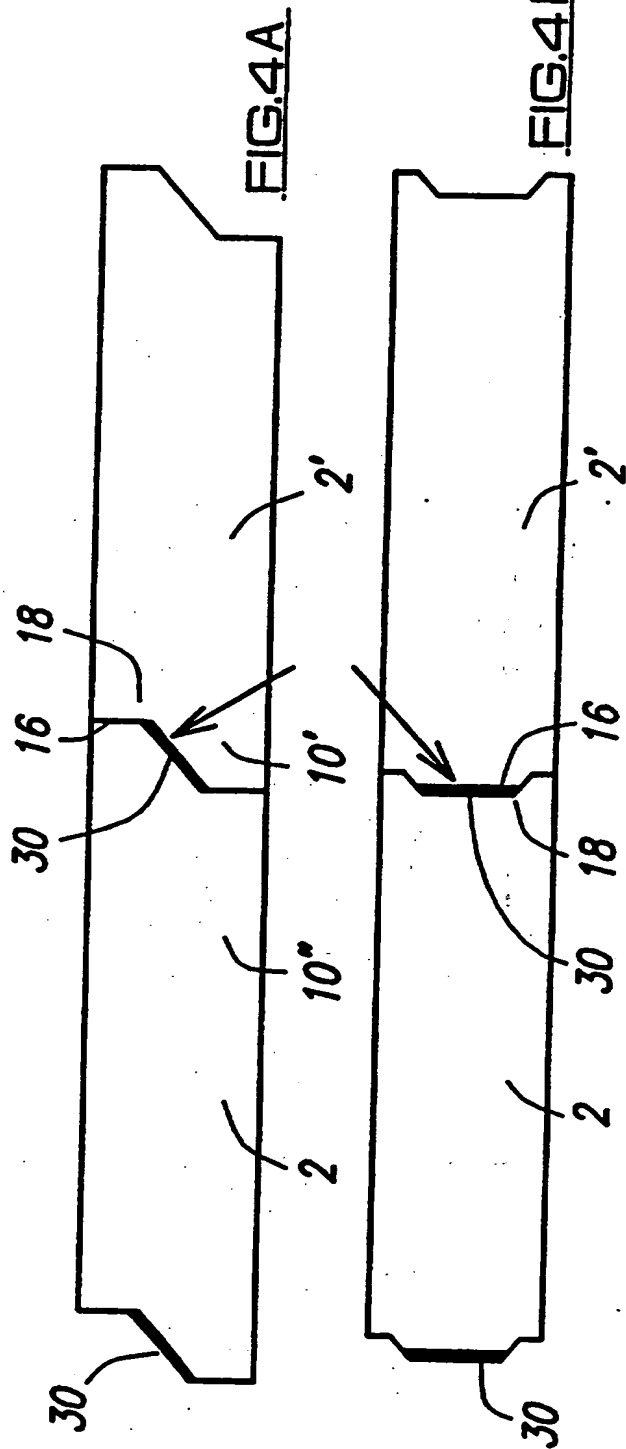
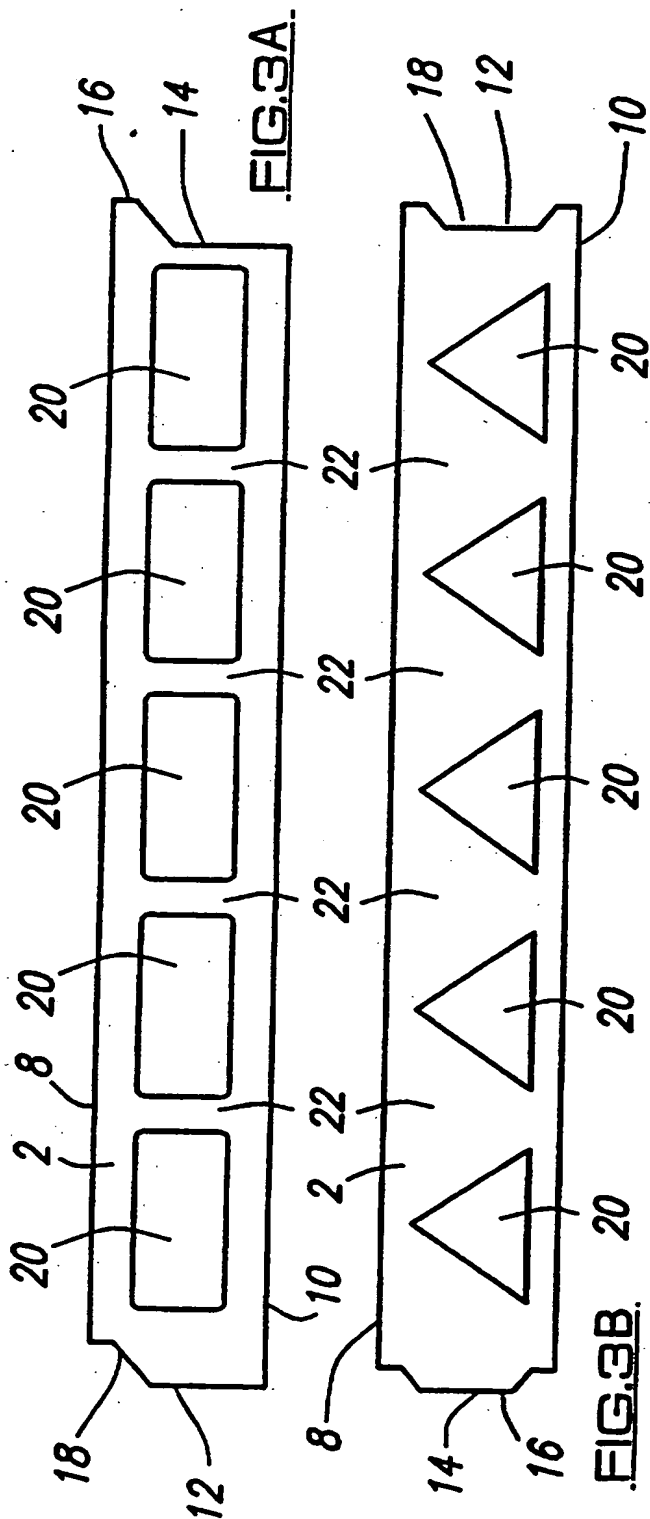
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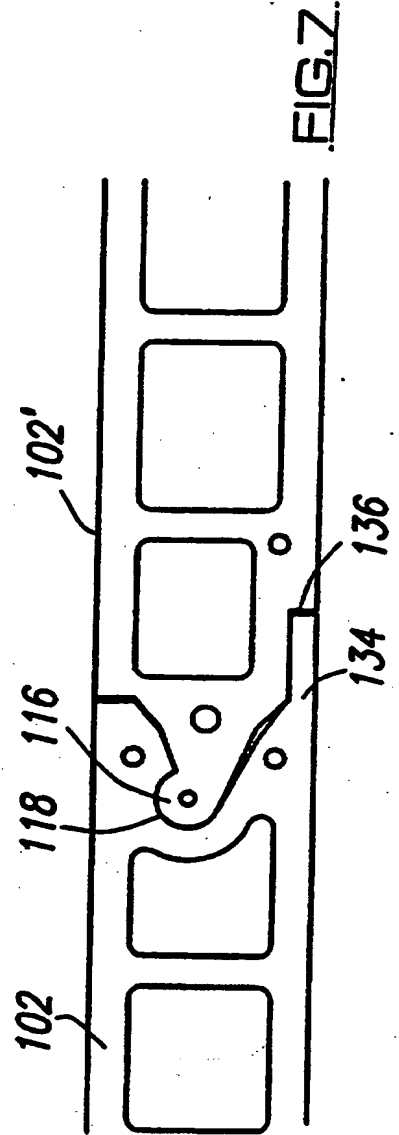
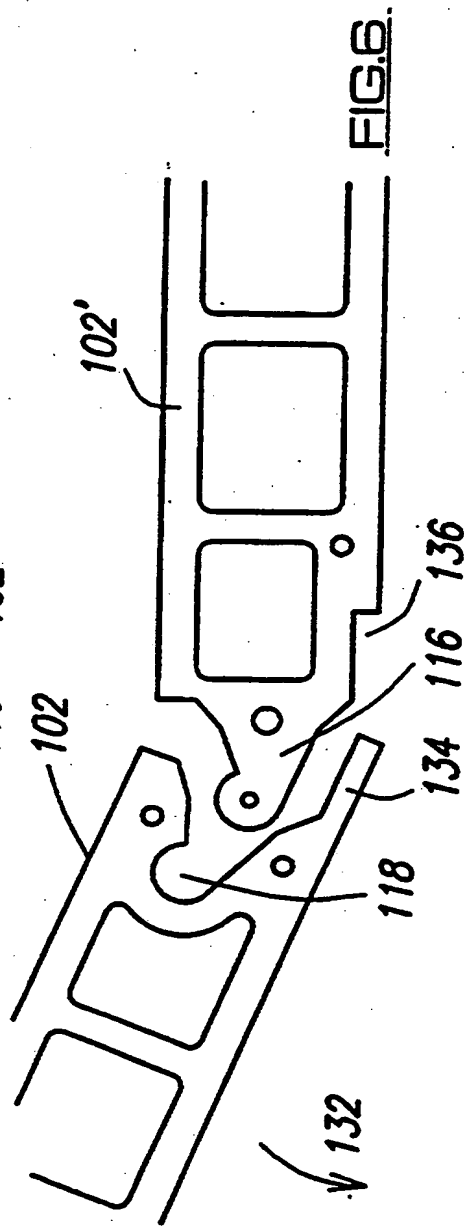
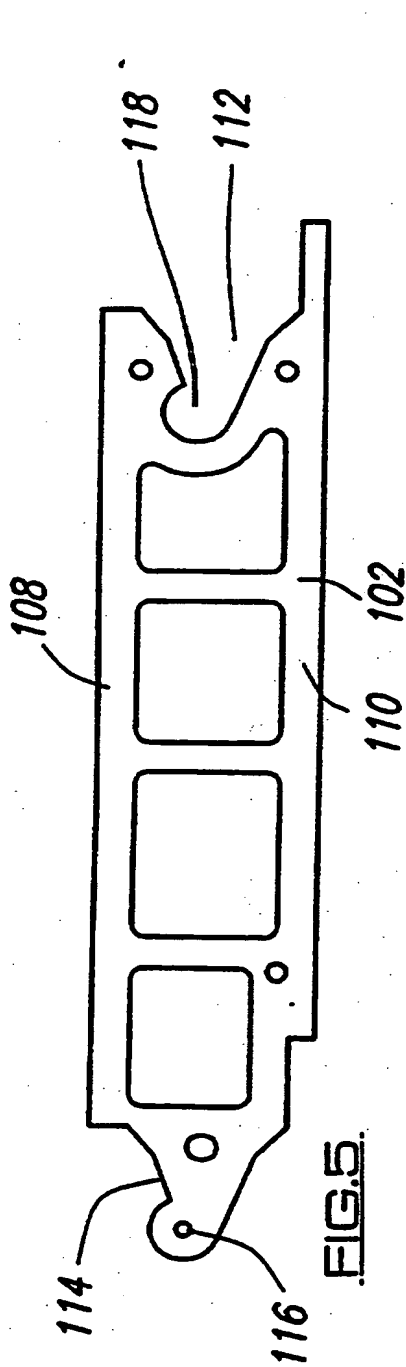


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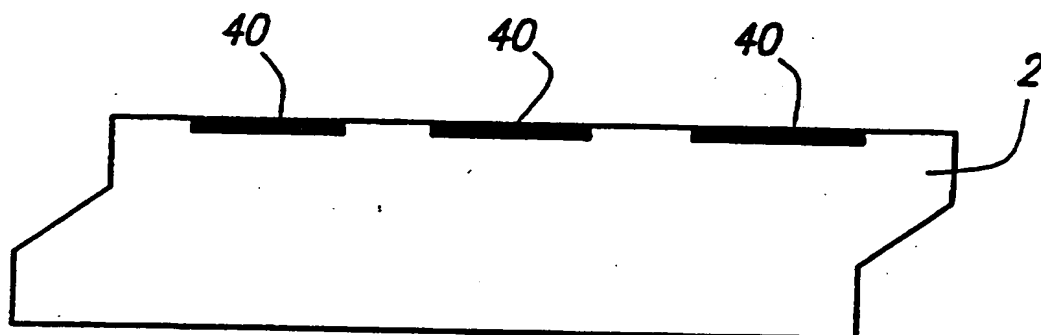


FIG. 8A

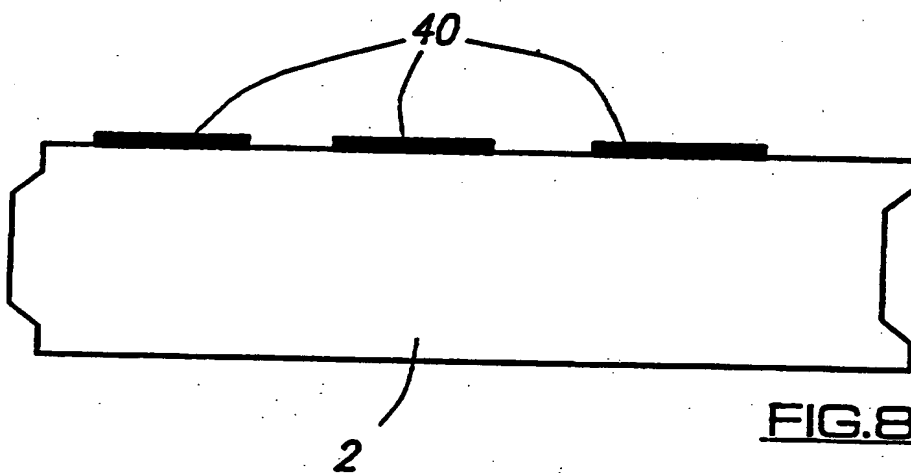


FIG. 8B

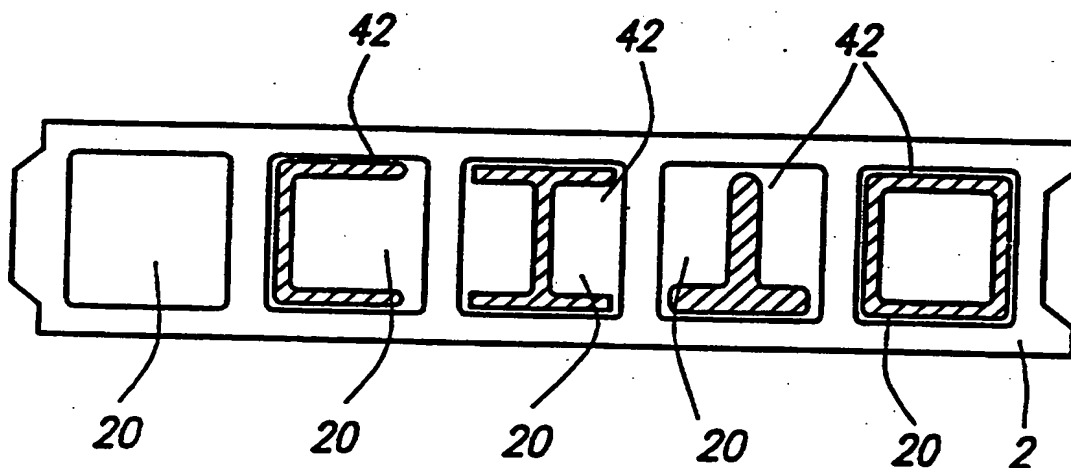


FIG. 9

## INTERNATIONAL SEARCH REPORT

onal Application No

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A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 6 E04C2/40 E06B9/15 B62D25/20 B62D29/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 6 E04C E06B B62D B65D

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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages              | Relevant to claim No.                                  |
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| X<br>A     | GB,A,2 155 527 (ROLKAN) 25 September 1985<br>see the whole document                             | 1-4<br><br>5-9, 12,<br>17-19,<br>21, 24,<br>31, 32, 34 |
| A          | DE,A,32 02 385 (DOMNICK) 4 August 1983<br><br>see page 5, line 23 - page 9, line 26;<br>figures | 1-6,<br>12-19,<br>21, 24,<br>25, 34                    |
| A          | WO,A,86 00588 (SCHWEIZERISCHE ALUMINIUM)<br>30 January 1986<br>see the abstract                 | 12   |

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Date of the actual completion of the international search

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Authorized officer

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 95/02119

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| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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